

## Summary

Childhood overweight and obesity prevalence is at an alarming level and prevention is required to control the overweight and obesity epidemic. A lack of physical activity (PA), excessive sedentary behavior (SB) (such as TV watching and computer use) and poor eating habits contribute to the continuing obesity problem. Schools are an ideal setting to reach school-aged children for the promotion of health behaviors. However, to date school-based interventions have shown limited effects on energy balance-related behaviors (EBRBs) and body weight. This thesis aimed to fill the knowledge gap regarding our understanding of the limited success of previous school-based overweight prevention interventions by (1) exploring the mediating (how it works) and moderating (for whom and under what circumstances it works) mechanisms of school-based obesity prevention interventions targeting EBRBs, (2) exploring measurement issues of PA and SB by accelerometers, and (3) addressing social and environmental determinants of EBRBs.

Part I and Part II of this thesis focus on the working mechanisms of school-based obesity prevention interventions aimed at EBRBs. Chapter 2 presents the results of a longitudinal mediation analysis that explored behavioral mediators of changes in adiposity measures in the Dutch Obesity Intervention in Teenagers-study (DOiT). DOiT was an 8-month behavioral intervention program consisting of educational and environmental components. Results showed that sugar-containing beverages consumption mediated the intervention effect on body mass index (BMI). DOiT successfully lowered sugar-containing beverages consumption, which, in turn led to a smaller increase in BMI over time. We also found a positive association between computer time and BMI. However, since DOiT did not succeed in reducing computer time, we could not confirm a significant mediating effect of computer time. Chapter 3 reports the results of the systematic review on the moderators of school-based interventions targeting EBRBs. In total 61 articles were included. Gender, ethnicity, age, baseline values of outcomes, initial weight status and socioeconomic status were the most frequently studied potential moderators. We found no evidence for any of the studied moderators due to the mixed results in the included studies. However, despite the lack of strong evidence, girls appeared to benefit more from school-based interventions than boys. The quality of the moderation analyses in the included studies was generally not satisfactory. Chapter 4 presents the results of a systematic review on mediators of school-based interventions targeting EBRBs. In total 24 studies were included. We found strong evidence for self-efficacy and intention as mediators of PA interventions. Some evidence was found for a mediating effect of attitude, knowledge and habit strength on dietary behaviors. The majority of interventions failed to significantly change the hypothesized mediators, suggesting the need for more effective intervention strategies and sensitive measures.

Part III of this thesis examines the measurement issues of PA and SB using accelerometers. Chapter 5 describes the accelerometer protocol used in a sub-study of the European Commission funded ENERGY project ([www.projectenergy.eu](http://www.projectenergy.eu)). This sub-study of the

ENERGY project included children from five countries (Belgium, Greece, Hungary, the Netherlands, Switzerland). The protocol is based on best evidence on data collection and data processing for the specific age group (10-12yr). Chapter 6 describes the comparison of the commonly used accelerometer cut-points (100, 300, 800, 1100 counts per minute) for SB with observed sedentary time. A structured protocol was used for observing children during different activities, i.e., non-electronic sedentary games, watching television, playing computer games and playing outdoor while wearing an accelerometer. Estimated time spent sedentary varied considerably when applying the various cut-points. Our results suggest that the cut-point of <100 counts per minute is most appropriate.

In Part IV the social and environmental determinants of EBRBs are examined. In Chapter 7 EBRBs, adiposity measures and prevalence of overweight/obesity are compared between Turkish adolescents in Turkey and Turkish immigrant adolescents living in the Netherlands. Adolescents living in the Netherlands were more often overweight/obese, reported significantly higher consumption of sugar-containing beverages, lower fruit and vegetable intakes, higher PA levels, and less screen time and computer use than their peers living in Turkey. In Chapter 8 we examined the association between daily variations in rainfall and temperature with objectively assessed PA and SB in the ENERGY project. Lower maximum daily temperature and higher daily rainfall was associated with lower light, moderate-to-vigorous intensity PA and average overall level of PA. Higher daily rainfall was associated with more sedentary time. Chapter 9 evaluates the interpersonal and environmental mediators of the Transform-Us! mid-intervention effects on objectively measured PA during school recess and lunchtime. The Transform-Us! study is an Australian school-based intervention with four groups: SB intervention (SB-I), PA intervention (PA-I), combined PA+SB-I and a control group. There were no significant mediating effects on PA during recess and lunchtime. The PA-I and PA+SB-I had a significant positive intervention effect on perceived social support from the teacher for being active. The perceived school play environment was positively associated with moderate-to-vigorous PA during recess among girls. We also found a significant suppression effect of social support from teachers on LPA during recess in the PA+SB-I group, meaning that social support from teachers was associated with lower LPA during recess.

In Chapter 10 the results from this thesis are summarized and discussed. Identifying and evaluating relevant mediators and moderators of interventions should be a common approach for obesity prevention researchers. Subsequent intervention development should be based on the results of such studies. Applying effective intervention strategies while taking into account the needs and the characteristics of the various subgroups and also targeting the right mediators will help enhancing the effectiveness of school-based obesity intervention programs.